

Name: KR Date: Jan. 20/6 Period:       

### 2015-2016 Chemistry I Midterm Review

The midterm exam will consist of questions from the following units:

Unit 2: Measurement  
Unit 3: Atomic Structure  
Unit 4: The Periodic Table

Unit 5: Electrons in Atoms  
Unit 6: Classification and Nomenclature  
Unit 7: Bonding

#### Measurement

- Identify metric units
- Solve problems using the factor label method, including metric conversions
- Calculate percent error
- Calculate density, mass or volume of a substance

#### Atomic Structure

- Define the Law of Conservation of Mass
- Define the Law of Definite Proportions
- Define the Law of Multiple Proportions
- Describe the various atomic theories
- Distinguish between protons, neutrons and electrons

#### The Periodic Table

- Identify the group, period, and number of valence electrons for an element
- Identify an element as a metal, nonmetal, or metalloid
- Use the trends for ionization energy, atomic radius, and electronegativity to identify which elements will have the largest or smallest ionization energy, atomic radius or electronegativity.
- Identify the main physical and chemical properties of each group
- Identify the properties of metals and nonmetals
- Identify the likely charge of a monoatomic ion based on its position on the periodic table.

#### The Electron

- Write the complete electron configuration and electron dot structure for an element

#### Classification and Nomenclature

- Identify the properties and identify examples of pure substances, elements, compounds and mixtures
- Distinguish between heterogeneous and homogeneous mixtures
- Identify particle diagrams as elements, compounds or mixtures
- Identify the likely charge of a monoatomic ion based on its position on the periodic table.
- Locate the metals and nonmetals on the periodic table
- Locate the transition metals on the periodic table
- Write a chemical formula given the name of a compound
- Name a compound given its formula

- Recognize a polyatomic ion
- Identify a compound as ionic or covalent based on the atoms in the compound.

### Bonding:

- Identify a compound as ionic or covalent based on the electronegativity differences of the atoms in the compound.
- Draw the Lewis structures, determine the shape, and determine the polarity of covalent molecules
- Define ionic and covalent bonds
- Compare and contrast the four types of intermolecular forces (IMF's) in terms of strength and where they are found

### Midterm Formulas







$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\% \text{ Error} = \frac{|\text{Actual Value} - \text{Experimental Value}|}{\text{Actual Value}} \times 100$$

$$100 \text{ cm} = 1 \text{ m} \quad 1000 \text{ g} = 1 \text{ kg} \quad 1000 \text{ mL} = 1 \text{ L}$$

### Prefixes

- 1 - mono
- 2 - di
- 3 - tri
- 4 - tetra
- 5 - penta
- 6 - hexa

Geometry	Shape of Molecule
Linear	
Trigonal Planar	
Bent	
Tetrahedral	
Trigonal Pyramidal	
Bent	

1. How many significant figures are in each measurement?

2. Round off each of these measurements to three significant figures.

3. Round off each of the answers correctly.

4. How many significant figures are in the following measurements?

5. List the following conversion factors:

6. How many mg are in 16.5 kg?

7. How many inches are there in 2.2 meters? (1 in = 2.54 cm)

8. How many mL are in 42.7 L?

9. Complete the following table so that all measurements in each row have the same value.

3

10. The average direct daily use of water in the United States per person is 300 000 mL. What is the volume, in gallons, of this amount of water? (1 gallon = 128 fluid ounces, 1 fluid ounce = 29.57 mL)

WANTED: ? gallons  
 DATA: 300 000 mL = 1 person  
 1 gallon = 128 oz  
 1 oz = 29.57 mL

$$\left. \begin{array}{l} \text{WANTED: ? gallons} \\ \text{DATA: 300 000 mL = 1 person} \\ 1 \text{ gallon} = 128 \text{ oz} \\ 1 \text{ oz} = 29.57 \text{ mL} \end{array} \right\} \begin{array}{l} ? \text{ gallons} = 300,000 \text{ mL} \times \frac{1 \text{ oz}}{29.57 \text{ mL}} \times \frac{1 \text{ gallon}}{128 \text{ oz}} \\ = 79 \text{ gallons} \rightarrow \boxed{80 \text{ gallons}} \end{array}$$

11. A piece of copper metal has a mass of 17.62 pounds. What is the copper mass in kilograms?  
~~UNIT: How many moles of copper is this?~~ (1 kg = 2.2 pounds)

WANTED: ? kg  
 DATA: 17.62 lb  
 1 kg = 2.2 lb

$$\left. \begin{array}{l} \text{WANTED: ? kg} \\ \text{DATA: 17.62 lb} \\ 1 \text{ kg} = 2.2 \text{ lb} \end{array} \right\} ? \text{ kg} = 17.62 \text{ lb} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} = \boxed{8.009 \text{ kg}}$$

12. A graduated cylinder contains 11.1 mL of mercury. The mass of the mercury was found to be 151.01 g. Calculate the density of the mercury.

WANTED: ? Density (g/mL)  
 DATA: 11.1 mL = V  
 151.01 g = M

$$\left. \begin{array}{l} \text{WANTED: ? Density (g/mL)} \\ \text{DATA: 11.1 mL = V} \\ 151.01 \text{ g} = M \end{array} \right\} \text{Density} = \frac{\text{mass}}{\text{volume}} = \frac{151.01 \text{ g}}{11.1 \text{ mL}} = \boxed{13.6 \text{ g/mL}}$$

13. Lead has a density of 11.35 g/mL. If I have a lead sinker that has a mass of 22.0 g, what is its volume?

WANTED: ? volume (mL)  
 DATA: Density = 11.35 g/mL  
 mass = 22.0 g

$$\left. \begin{array}{l} \text{WANTED: ? volume (mL)} \\ \text{DATA: Density = 11.35 g/mL} \\ \text{mass = 22.0 g} \end{array} \right\} \begin{array}{l} D = \frac{M}{V} \\ V = \frac{M}{D} \end{array} \quad V = \frac{22.0 \text{ g}}{11.35 \text{ g/mL}} = \boxed{1.94 \text{ mL}}$$

14. Older pennies are typically made of copper. If a roll of pennies has a volume of 17.3 mL, and the density of copper is 8.96 g/mL, what is the mass of a roll of pennies?

WANTED: mass (g)  
 DATA: volume = 17.3 mL  
 density = 8.96 g/mL

$$\left. \begin{array}{l} \text{WANTED: mass (g)} \\ \text{DATA: volume = 17.3 mL} \\ \text{density = 8.96 g/mL} \end{array} \right\} \begin{array}{l} D = \frac{M}{V} \\ M = D \cdot V \end{array} \quad M = (8.96 \frac{\text{g}}{\text{mL}})(17.3 \text{ mL}) = \boxed{155 \text{ g}}$$

15. A student determines, by experiment, the density of a liquid to be 0.1369 g/cm<sup>3</sup>. The accepted value is 0.1478 g/cm<sup>3</sup>. What is the student's % error?

$$\% \text{ error} = \frac{|\text{Actual Value} - \text{Experimental value}|}{\text{Actual Value}} \times 100 \quad \leftarrow \text{given is reference materials}$$

accepted value =  
actual value

$$= \frac{0.1478 \text{ g/cm}^3 - 0.1369 \text{ g/cm}^3}{0.1478 \text{ g/cm}^3} \times 100 = \boxed{7.375 \%}$$

## Atomic Structure

16. Paraphrase the work of the following scientists on modern atomic theory.

- a. Ernest Rutherford → Gold Foil Experiment  
concluded that the atom consists of a small, dense, positive nucleus (most of the mass) surrounded by the electrons (make up most of volume)  
(most of atom is empty space)
- b. Bohr (Planetary Model) The electrons orbit the nucleus like the planets orbit around the sun - the electrons move in specific orbits
- c. Schrodinger (Modern Model) - small, dense, positive nucleus surrounded by an electron cloud. → probability of finding an electron in the cloud increases as you get closer to the nucleus

17. Describe and explain the significance of Ernest Rutherford's gold foil experiment.

- ① Rutherford shot alpha particles (positively charged particles) at a thin gold foil.
- ② Based on Thomson's model; he expected all the alpha particles to pass through the foil.
- ③ Most did pass through, but a few were deflected.
- ④ concluded: . atoms contain a positively charged nucleus that is small & dense  
. nucleus is surrounded by negatively charged electrons  
. most of the atom is empty space.

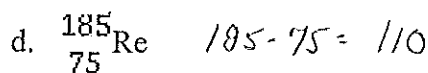
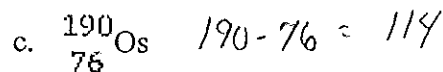
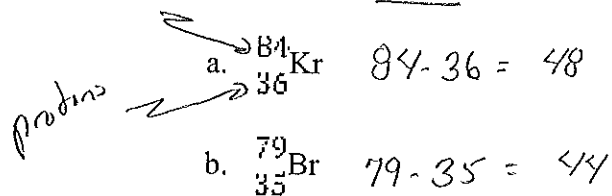
18. Define the following terms:

- a. Atom - smallest particle of an element that retains its properties
- b. Atomic number - number of protons in an atom's nucleus  
found on P.T. and unique to each element
- c. Mass number number of protons + number of neutrons  
found on P.T.
- d. Isotope - atoms of the same element with the same number of protons, but different number of neutrons.
- e. Average atomic mass weighted average of the masses of all isotopes of an element

19. How do Neon-20 and Neon-21 differ from each other?

Ne-20 and Ne-21 are isotopes. They both have 10 protons, but Ne-20 has 10 neutrons and Ne-21 has 11 neutrons  
# of neutrons different

mass # 20. How many neutrons does an atom of each isotope contain?  $\text{neutrons} = \text{mass \#} - \text{protons}$



21. Name the element and calculate the number of requested subatomic particles in each isotope.

$109 - 47 =$

a. Neutrons in Ag-109 Silver 62 neutrons

c. Electrons in Mo-96 Molybdenum has 42 electrons

b. Protons in Sn-118 Tin has 50 protons

d. Electrons in Sc-45 Scandium has 21 electrons

22. Complete the following table for the three subatomic particles

Particle	Charge	Location	Relative mass
proton	+1	nucleus	1
neutron	0	nucleus	1
electron	-1	outside the nucleus	1/2000

} about the same

much smaller than p or n

23. Complete the following table

Isotopic Symbol	# p	# e	# n	Mass number	Charge
Po-210	84	84	126	210	0
K-40	19	18	$40 - 19$ (21)	40	+1
P-33	15	18	$33 - 15$ (18)	33	-3

24. In a neutral atom, the number of which two subatomic particles must always be equal?

In a neutral atom the number of protons and electrons must be equal

## Periodic Trends

25. Complete the table comparing metals, nonmetals and metalloids.

	Metal	Nonmetal	Metalloid
Location	left side of P.T	right side of P.T	on the staircase
Properties	ductile malleable conductive shiny  most are solids with high melting points (except Hg)	many are gases or brittle solids  poor conductors  lower melting points than metals	share properties of metals & nonmetals  dull, brittle solids  semiconductors

26. Give the name and symbol of two elements that have properties similar to potassium.

Elements in the same group have similar properties - Li, Na, Rb, Cs, Fr

27. Which of the following are transition metals: Cr, Cd, Cs, Cu, Co, Ca, Ce?

Cr, Cd, Cu, Co

(Ce is an inner transition metal)

Cs - group 1 alkali metal

Ca - group 2 alkaline earth metal

28. Define and describe the trends of the following periodic properties as you go across a period or down a group.

Periodic Property	Definition	Trend across Period →	Trend down Group ↓
Ionization Energy	energy required to remove an electron from a neutral atom	increases	decreases
Atomic Radius	size of an atom	decreases	increases
Electronegativity	measures the ability of an atom in a compound to attract electrons to itself. (Most electronegative element is <u>F</u> )	increases	decreases

29. Identify the larger atom of each pair.

a. Sodium or chlorine

b. Arsenic or nitrogen

c. Fluorine or cesium

30. On the periodic table at the end of the review packet:

Label:

Metals - left side

Nonmetals - right side

Metalloids - on the stairs

Groups - columns

Periods - rows

Alkali metals - group 1

Alkaline earth metals group 2

Transition metals group 3-12

Halogens group 17

Noble gases group 18

Inner Transition metals

"s" block - group 1 & 2

"p" block groups 13-18

"d" block groups 3-12

"f" block below the table

31. Write the valence electrons for families 1,2,13,14,15,16,17,18 ← see attached

32. Identify the charge on the ion that the element would form for groups 1, 2, 13, 15, 16, 17, 18  
see attached

### Electrons

33. Complete the table.

Element	Complete Electron Configuration	Valence Electrons	Electron Dot Structure
Aluminum	$1s^2 2s^2 2p^6 3s^2 3p^1$	3	$\cdot \text{Al} \cdot$
Barium	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$	2	$\text{Ba} \cdot$
Chlorine	$1s^2 2s^2 2p^6 3s^2 3p^5$	7	$\cdot \ddot{\text{Cl}} \cdot$
Iron	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$	2	$\text{Fe} \cdot$
Nitrogen	$1s^2 2s^2 2p^3$	5	$\cdot \ddot{\text{N}} \cdot$
Selenium	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$	6	$\cdot \ddot{\text{Se}} \cdot$
Silver	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^9$	2	$\text{Ag} \cdot$
Zinc	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$	2	$\text{Zn} \cdot$

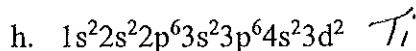
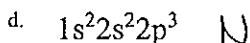
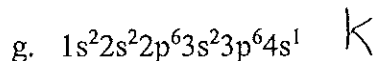
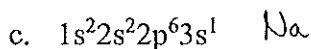
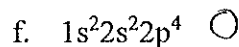
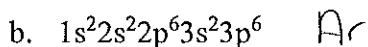
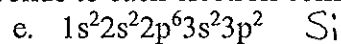
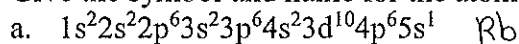
34. What group of elements has the most stable type of electron configuration? Why? What does it end in?

Noble gases have the most stable electron configuration because they have 8 valence electrons

electron configuration ends in  $s^2 - p^6$

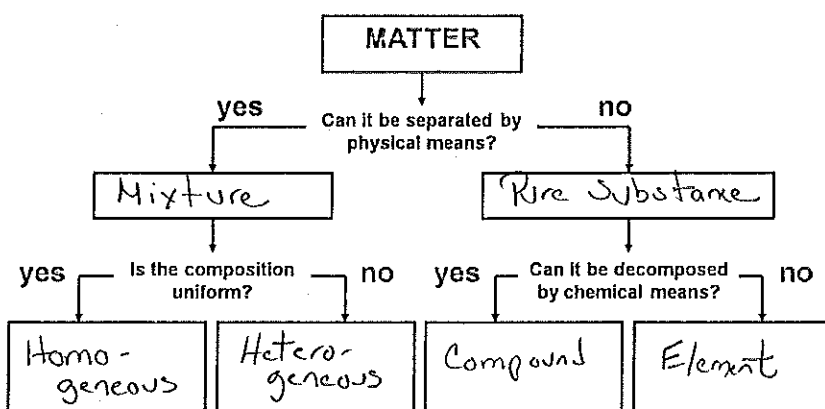


35. Give the symbol and name for the atom that corresponds to each electron configuration.



### Classification and Nomenclature

36. Complete the following flowchart



37. For each of the following terms, list 2 - 3 characteristics and list at least one example. Circle the pure substances.

a. Elements cannot be broken down by chemical means

examples: Cu, C, O<sub>2</sub> Pure substance  
Au, Fe, Hg found on periodic table

b. Compound can be broken down by chemical means

examples: CO, CO<sub>2</sub> Pure substance, elements combined in fixed amounts  
NaCl, H<sub>2</sub>O properties of compounds are different than elements that make them up.

c. Mixture 2 or more substances physically combined (and separated)

examples: air, trail mix substances that make up the mixture retain their own properties  
salt water substances are combined in variable amounts  
chex mix

38. Compare heterogeneous and homogenous matter (define and provide examples of each).

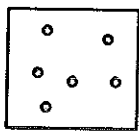
Heterogeneous mixture - not uniform throughout  
examples: sand & water, clay & water, trail mix, salad

Homogeneous mixture - uniform throughout (also known as "solution")  
examples: air, salt water, kool-aid

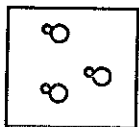
39. Refer to the following particle diagrams:

- Identify the contents of each picture as a pure substance or a mixture.
- Which picture represents an element? *A*
- Which picture represents a compound? *B*
- Which picture represents a mixture? *C*

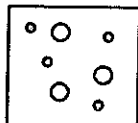
*A & B are pure substances  
C is a mixture*



A



B



C

40. Determine if the following combinations of atoms will form ionic or covalent bonds:

a. Mg and Cl *Ionic*

c. Al and O *Ionic*

b. N and Cl *covalent*

d. H and O *covalent*

41. In an ionic compound, what charge ion will the following elements form? (*learn the pattern on the P.T.*)

a.  $O^{-2}$

c.  $Mg^{+2}$

e.  $N^{-3}$

b.  $Cl^{-1}$

d.  $Al^{+3}$

f.  $K^{+1}$

42. Write the formulas for the following compounds:

Compound	Ionic or Covalent? (I or C)	Transition Metal? (Y or N)	Polyatomic ion? (Y or N)	Formula
Potassium oxide	I	N	N	$K^{+1}O^{-2} \rightarrow K_2O$
Aluminum sulfide	I	N	N	$Al^{+3}S^{-2} \rightarrow Al_2S_3$
Copper (II) nitrate	I	Y	Y	$Cu^{+2}NO_3^{-1} \rightarrow Cu(NO_3)_2$
Lead (IV) oxide	I	Y	N	$Pb^{+4}O^{-2} \rightarrow Pb_2O_4$
Carbon tetrachloride	C	—	—	$CCl_4$
Dinitrogen monoxide	C	—	—	$N_2O$
Ammonium Phosphate	I	N	Y (2)	$NH_4^{+1}PO_4^{-3} \rightarrow (NH_4)_3PO_4$
Copper (II) hydroxide	I	Y	Y	$Cu^{+2}OH^{-1} \rightarrow Cu(OH)_2$
Diphosphorus pentoxide	C	—	—	$P_2O_5$

*Ionic: starts with a metal or ammonium*

*transition metal: (NOT group 1 or 2 or Al, Zn, Ag) look for Roman Numerals*

*polyatomic ion: ends in -ate, -ite, -hydroxide*

Silver sulfide	I	N	N	$\text{Ag}^{+1} \text{S}^{-2}$	$\text{Ag}_2\text{S}$
Iron (II) sulfate	I	Y	Y	$\text{Fe}^{+2} \text{SO}_4^{-2}$	$\text{FeSO}_4$
Tin (III) bicarbonate	I	Y	Y	$\text{Sn}^{+3} \text{HCO}_3^{-1}$	$\text{Sn}(\text{HCO}_3)_3$

43. Name the following compounds:

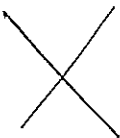
Formula	Ionic or Covalent? (I or C)	Transition Metal? (Y or N)	Polyatomic ion? (Y or N)	Compound
$\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$	I	N	Y	ammonium acetate
$\begin{matrix} +6 & \text{Cr}_2\text{O}_3 & -6 \\ +3 & & -2 \end{matrix}$	I	Y		chromium (III) oxide
$\begin{matrix} +2 & \text{Pb}(\text{NO}_3)_2 & -2 \\ & & -1 \end{matrix}$	I	Y	Y	lead (II) nitrate
$\text{Ag}_2\text{CrO}_4$	I	N	Y	silver chromate
$\begin{matrix} \text{P}_4\text{O}_{10} \\ \text{tetra} - \text{deca} \end{matrix}$	C	—	—	tetraphosphorus decoxide
$\begin{matrix} \text{NBr}_3 \\ \text{tri} \end{matrix}$	C	—	—	nitrogen tribromide
$\text{Al}_2(\text{CrO}_4)_3$	I	N	Y	aluminum chromate
$\begin{matrix} +4 & \text{Sn}(\text{Cr}_2\text{O}_7)_2 & -4 \\ & & -2 \end{matrix}$	I	Y	Y	tin (IV) dichromate
$\begin{matrix} \text{N}_2\text{O}_4 \\ \text{di} - \text{tetra} \end{matrix}$	C	—	—	dinitrogen tetroxide

### Chemical Bonds

44. Define the following terms:

- Octet rule - atoms will gain, lose, or share electrons to fill their valence shell (most atoms "want" 8e<sup>-</sup> in valence shell)
- Ionic bond - forms between a metal and a nonmetal  
electrons are transferred, substance is neutral (charges cancel)
- Covalent bond - forms between nonmetals  
electrons are shared.

45. Complete the following table comparing ionic and covalent bonds

Bond type	Subtype	Atoms in bond	Electronegativity difference	Electron description	
Ionic		metal - nonmetal	greater than 1.6	electrons transferred from the metal to nonmetal	$\text{Na} \rightarrow \text{Cl}$ $3.0 - 0.9 = 2.1$
Covalent	Polar covalent	nonmetal - nonmetal	0.5 - 1.6	electrons are shared <u>unequally</u>	$\text{H} \text{---} \text{O} \text{---} \text{Cl}$ $3.0 - 2.1 = 0.9$
	Nonpolar covalent	nonmetal - nonmetal	less than 0.5	electrons are shared <u>equally</u>	$\text{F} \text{---} \text{O} \text{---} \text{F}$ $4.0 - 4.0 = 0$

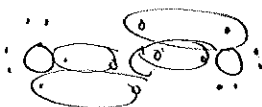

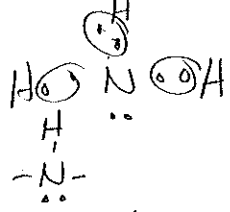
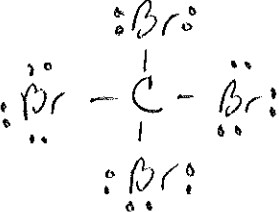
46. Determine if the following combination of atoms will form ionic, polar covalent, or nonpolar covalent bonds:

	I	PC	NP
a. Mg and Cl	M-NM $3.0 - 1.2 = 1.8$		
b. N and F		NM-NM $3.5 - 2.1 = 1.4$	
c. Al and O	M-NM $3.5 - 1.5 = 2.0$		
d. H and O		NM-NM $3.5 - 2.1 = 1.4$	
e. Br and Br		NM-NM $2.8 - 2.8 = 0$	

47. Complete the table

Properties of Ionic Compounds	Properties of Covalent Compounds
<ul style="list-style-type: none"> <li>• High melting point</li> <li>• Form crystals</li> <li>• Hard &amp; Brittle (solids)</li> <li>• Conduct electricity when dissolved in water or melted</li> <li>• Good insulators</li> </ul> <p>(see notes in Bonding and I)</p>	<ul style="list-style-type: none"> <li>• relatively low melting (and boiling) points</li> <li>• tend to be soft and relatively flexible (s, l, g)</li> <li>• more flammable than ionic compounds</li> <li>• never conduct electricity (even when dissolved in water)</li> <li>• many do not dissolve in water</li> </ul>

48. Complete the following table

Molecule	Lewis structure	Shape
CO <sub>2</sub>	 $\ddot{\text{O}}=\text{C}=\ddot{\text{O}}$	Linear
SCl <sub>2</sub>	 $\text{:}\ddot{\text{Cl}}-\ddot{\text{S}}-\ddot{\text{Cl}}\text{:}$	Bent
NH <sub>3</sub>	 $\begin{array}{c} \text{H} \\   \\ \text{H}-\text{N}-\text{H} \\   \\ \text{H} \end{array}$	Trigonal Pyramid
CCl <sub>4</sub>	 $\begin{array}{c} \text{:}\ddot{\text{Br}}\text{:} \\   \\ \text{:}\ddot{\text{Br}}-\text{C}-\ddot{\text{Br}}\text{:} \\   \\ \text{:}\ddot{\text{Br}}\text{:} \end{array}$	Tetrahedral

(2 bonded atoms on central atom)

2 lone pairs and  
2 bonded atoms on  
central atom

(3 bonded atoms and  
1 lone pair on  
central atom)

(4 bonded atoms on  
central atom)

49. Complete the table describing Intermolecular Forces (IMF)

IMF	Definition	Occurs between...	Relative Strength
(London) Dispersion	results from movement of electrons and the creation of a "temporary dipole"	All molecules	weakest type It is stronger in larger molecules because there are more electrons
Dipolar	opposite "charges" separated by a short distance between different atoms	Polar molecules	medium
Hydrogen Bonding	A hydrogen atom is bonded to a highly electronegative atom	only between H-F H-O H-N	strongest

(FON - home)

### Midterm Multiple Choice Practice

- An atom composed of 16 protons, 16 electrons, and 16 neutrons is
  - $^{48}_{16}\text{S}$
  - $^{16}_{32}\text{Ge}$
  - $^{32}_{16}\text{S}$
  - $^{16}_{32}\text{S}$
- Which list contains elements that fall within the same group on the periodic table?
  - He, Ar, Xe
  - K, Rb, Ba
  - O, F, Ne
  - H, He, Li
- Which of the following statements about the periodic table are correct?
  - Elements are arranged in order of increasing atomic mass.
  - A period is a horizontal row.
  - The properties of elements within a period vary from element to element.
  - I only
  - I and II only
  - I, II, and III
  - I and III only
  - II and III only**
- Select the electron configuration for silicon, atomic number 14.
  - $1s^2 2s^2 2p^2 3s^2 3p^2 3d^2 4s^2$
  - $1s^2 2s^2 2p^4 3s^2 3p^4$
  - $1s^2 2s^2 2p^6$
  - $1s^2 2s^2 2p^6 3s^2 3p^2$**
- Which of these statements characterize the nucleus of an atom?
  - It has a positive charge.
  - It is very dense.
  - It is composed of protons, electrons, and neutrons.
  - I and II only**
  - II and III only
  - I and III only
  - I, II, and III
- Which of these statements about the periodic table is correct?
  - Elements are arranged in order of increasing atomic mass.
  - A period is a horizontal row.
  - Nonmetals are located on the right side of the periodic table.
  - I only
  - I and II only
  - I, II, and III
  - I and III only
  - II and III only**
- Which of the following properties increases as you move across a period from left to right?
  - Electronegativity
  - Ionization Energy
  - Atomic Radius
  - I and II only**
  - I and III only
  - II and III only
  - I, II, and III

8. List the symbols for sodium, sulfur, and cesium in order of increasing atomic radii.
- a. Na, S, Cs  $S < Na$  c. Cs, Na, S  
**b. S, Na, Cs**  $Na < Cs$  d. Cs, S, Na
9. The electron configuration for an element in the halogen group should always end with
- a.  $ns^2np^6$  **c.  $ns^2np^5$**   
 b.  $ns^2np^4$  d.  $ns^2np^2$
- $n = \text{energy level}$   
 (period #)
10. The electron configuration for an element in the noble gas group should always end with
- a.  $ns^2np^6$**  c.  $ns^2np^5$   
 b.  $ns^2np^4$  d.  $ns^2np^2$
11. Which of these is not an ionic compound?
- a. KF  $M - NM$  c.  $Na_2SO_4$   
**b.  $SiO_2$**  d.  $Na_2O$
12. Which statements are correct when barium and oxygen react to form an ionic compound?
- I. Barium atoms lose 2 electrons and form a cation  $Ba^{+2}$   $Ba^{+2} O^{-2}$   
 II. Oxygen atoms form oxide anions ( $O^{-2}$ )  $BaO$   
 III. In the compound the ions are present in a one-to-one ratio
- a. I and II only c. I and III only  
 b. II and III only **d. I, II, and III**
13. How many valence electrons does arsenic have?
- a. 2 c. 4  
 b. 3 **d. 5**
14. What is the name of  $AlCl_3$ ?
- a. Aluminum trichloride d. Aluminum chlorate  
 b. Aluminum (III) chloride **e. Aluminum chloride**  
 c. Aluminum chlorite
15. The Roman numeral in manganese (IV) sulfide indicates the
- a. Group number on the periodic table  
**b. Positive charge on the manganese ion**  
 c. Number of manganese ions in the formula  
 d. Number of sulfide ions needed in the formula
16. Which of these compounds are covalent?
- a.  $CaSO_4$   $NM - NM$   
**b.  $N_2O_4$**   
 c.  $NH_4NO_3$  - this one starts with the polyatomic ion  $NH_4^+$  and is considered ionic  
 d.  $CaS$

